

All-out Assault on Antarctica

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Operation Deepfreeze Carves Out United States Bases for a Concerted International Attack on Secrets of the Frozen Continent

BY REAR ADMIRAL RICHARD E. BYRD, USN (RET.)*

NOT long ago I received a radio message from the southernmost human beings on earth.

"Huts buried to rooftops with drifting snow; temperature plunged to minus 53," reported Little America, 8,761 miles from Washington, D. C., and 812 miles from the South Pole. "Ninety percent personnel talked to loved ones via ham radio. Beautiful aurora observed daily."

Winter at the Bottom of the World

In the heat of a Northern Hemisphere summer it may be hard to realize that down at the other end of the world 166 Americans are living amid blizzards, bone-piercing cold, and a four-months-long night.

These men are the hardy Seabees and Navy specialists we left behind in Antarctica last March to build and man two bases 447 miles apart at McMurdo Sound and Little America V (map, page 147). Around them rages the worst weather in the world; yet in their snug huts in the snow the men enjoy daily movies, innerspring mattresses, hot and cold running water, soft drinks, and steaks to order.

Other countries hold similar beachheads, for this is a great international effort. Eleven nations are joining forces in the biggest assault ever made on the secrets of the white continent, nearly twice the size of the United States, that covers the bottom of our planet.

This major campaign is being waged in behalf of science, but it is using many of war's tools—ships, planes, and ponderous tracked vehicles. Its "troops" are as highly

trained as any that a fighting war demands.

To a man who has devoted thirty years of his life to exploring the polar regions and preaching the importance of Antarctica, it is an enormous satisfaction to see this job at last get the tools that it demands. It is my privilege to have a part in it as Officer in Charge of United States Antarctic Programs, now and during the International Geophysical Year.†

When I sailed on my first expedition to Antarctica in 1928, my flagship was the wooden bark *City of New York*, 502 tons displacement and 200 horsepower. On my fifth and most recent trip, the 1955-56 phase of U. S. Operation Deepfreeze, the ship that took me to the south polar continent was the Navy's newest icebreaker, *Glacier*, 8,625 tons displacement and 21,000 horsepower.

Quite a difference—and it's typical of the big advantage we have today.

* For three decades the National Geographic Society has been privileged to cooperate in the history-making polar explorations of Richard Evelyn Byrd, first man to fly over the North and South Poles and, since 1953, a Trustee of The Society. Admiral Byrd's five previous personal narratives in the NATIONAL GEOGRAPHIC MAGAZINE are immortal chapters in the annals of arctic and antarctic exploration: "Flying Over the Arctic," November, 1925; "First Flight to the North Pole," September, 1926; "Conquest of Antarctica by Air," August, 1930; "Exploring the Ice Age in Antarctica," October, 1935; and "Our Navy Explores Antarctica," October, 1947.

† See "The International Geophysical Year: Man's Most Ambitious Study of His Environment," by Dr. Hugh L. Dryden, Director of the National Advisory Committee for Aeronautics, Home Secretary of the National Academy of Sciences, and Trustee of the National Geographic Society, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1956.



Berthed in Ice, U.S.S. *Glacier* Brings Rear Admiral Richard E. Byrd Back to Antarctica

The Navy's newest icebreaker crunched to this majestic landing at Ross Island on December 18, 1955. Helicopters from the sturdy ship scouted for bases for Operation Deep Freeze, which took place in the Antarctic south.



Mount Erebus, Landmark for Explorers, Backdrops Sailors Playing Tag with Penguins

The dozing volcano climbs 13,200 feet from bay ice to clouds above McMurdo Sound; a faint plume of steam rises from its crater. The Scott and Shackleton expeditions camped in the bay in 1906 and 1907.

My first flight to the South Pole, on November 28-29, 1929, was made in a Ford trimotor. It had 975 horsepower and cruised at 105 miles an hour. To get over the Queen Maud Range, we had to throw out 300 pounds of food.

On my latest flight to the South Pole, on January 8, 1956, I rode in a four-engine Sky-master (the Navy's R5D). It weighed more than six times as much as our Ford trimotor of 1929 and flew twice as fast. Far from having to jettison food, we had a hot lunch of pork chops, French fried potatoes, and peas above the world's most forbidding terrain.

Why Back for the Fifth Time?

Late last year Operation Deepfreeze sailed to Antarctica with 1,800 men. This November another big task force goes south to complete and staff the scientific stations, carry on the expedition's work, and relieve the wintering-over parties.

By Christmas of 1957 the *year-round* population of Antarctica will be many hundreds. If all goes well, 15 of this number will be Americans living and working at the geographic South Pole. Think of it! That is no longer a dream but a serious scientific objective.

People ask me why I keep going back to Antarctica again and again. Well, I like it there. I like the endless reaches of wind-rippled snow, the stark peaks, the awesome glaciers.

I like the clatter of tractor trains, the whir of helicopters, and shouts of men wrestling with vehicles and gear. Yes, and the howling of the huskies too; they're still needed for rescue work. I like the symbols of life's triumph in a lifeless land: the squawking skua gulls, the comical penguins, seals wheezing at their blowholes, the arching backs of whales.

Most of all, I guess, I like the challenge of it, for Antarctica still plays for keeps. And I believe, as the scientists do, that the things we can learn there will have a profound effect upon the lives of us all.*

Thus it was with the old sense of excitement that I stood on the bridge of the brand-new icebreaker *Glacier*, on December 15, 1955, as she entered the south polar pack, the ring of floating ice that guards the Antarctic Continent. We were scouting far ahead of the rest of the task force—two other icebreakers, three cargo ships, and a tanker. Rear Adm. George J. Dufek, operations commander, rode the freighter *Arneb*.

I want to make it clear at the outset that the credit goes to Admiral Dufek and those under his command for the direction of the ships, planes, and men. George Dufek, who was with me on two previous antarctic expeditions, commanded Task Force 43, which had for its mission the establishment of our antarctic bases (page 150).

With two of my staff I had joined *Glacier* in New Zealand after flying there from the United States and conferring on polar matters and the IGY program with Prime Minister S. G. Holland and other high officials of his Government. My companions were Dr. Paul Siple, now my deputy, whom many remember, I'm sure, as the Eagle Scout who was picked from the entire country to go with me in 1928 on my first antarctic expedition, and Maj. Murray Wiener of the Air Force.

As I explained to our New Zealand hosts, we planned the establishment of two main bases. One, to be erected on the Ross Ice Shelf in the Little America region, was to be the chief U. S. scientific station.

An Air Operating Facility, to be built on land far back in McMurdo Sound, would be the staging base for a daring airlift at the end of 1956. From it, Air Force planes would carry to the South Pole itself 500 tons of materials, as well as construction and wintering-

* As the Government's senior representative for antarctic affairs, Admiral Byrd is in charge of United States expeditions in the southernmost continent. Supervising multiple aspects of U. S. south polar programs, he coordinates the efforts of all Government departments concerned with the Antarctic. His unmatched knowledge and experience are called upon to keep the public accurately informed on antarctic matters and to foster harmonious relations in common scientific and operational goals with other countries taking part in the International Geophysical Year. Admiral Byrd also is charged with setting up a permanent unit for administration of U. S. antarctic undertakings.

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"Whirlybird" Thrashes Skyward to Scout a Safe Course Through the Ross Ice Pack

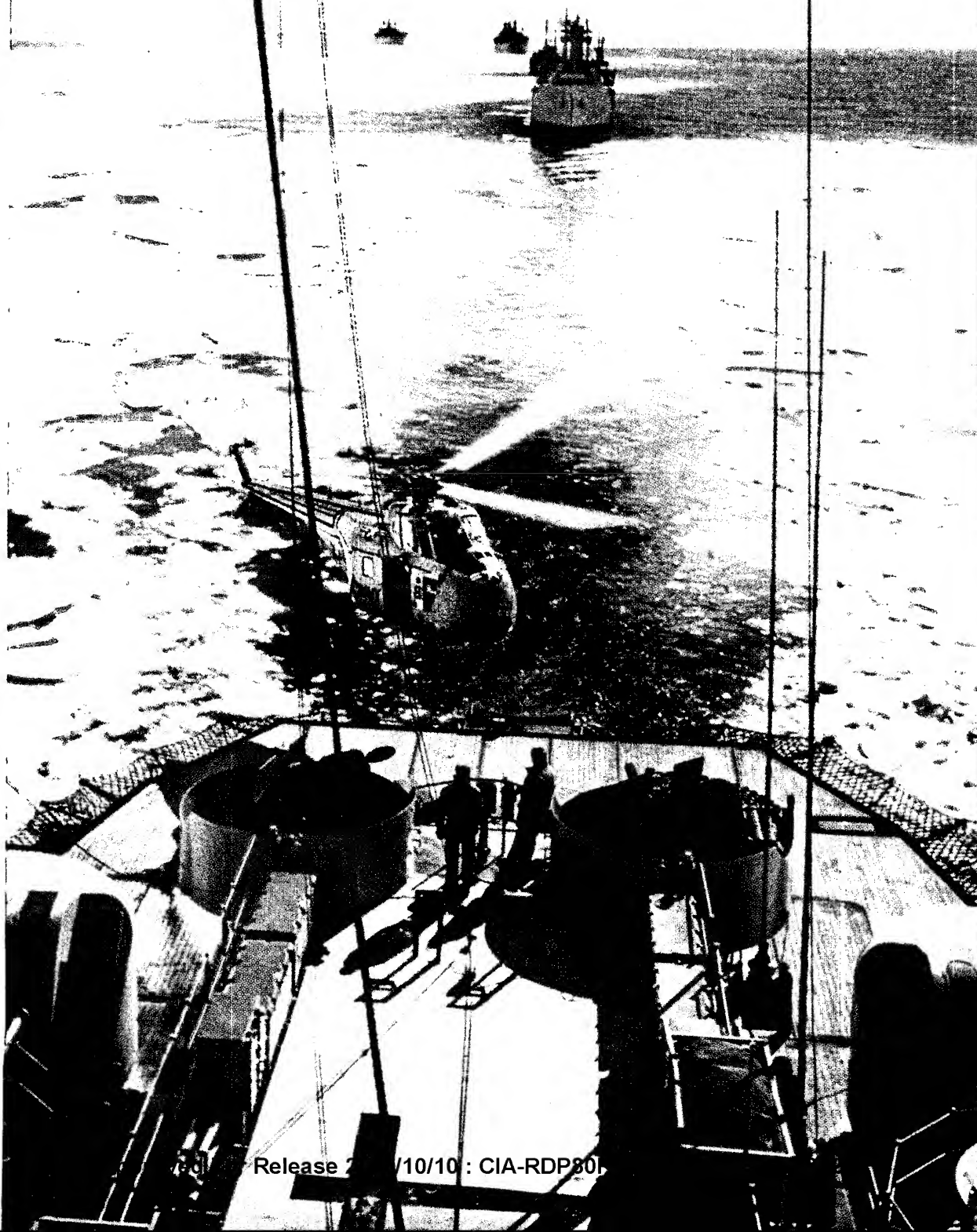
Last December Operation Deepfreeze sent seven ships and 1,800 men to the bottom of the world. Laden with prefabricated buildings and a staggering variety of supplies, the expedition prepared for United States scientific studies in Antarctica during the International Geophysical Year, 1957-58.

Here *Glacier* carves a channel through a 400-mile band of pack ice guarding the approaches to Antarctica. Steaming south in convoy, *Greenville Victory*, *Nespeken* (half hidden), *Wyandot*, and *Arneb* gingerly follow in her wake.

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Admiral H. Brown, National Geographic Staff

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Old Antarctic Hands Plant a Flag Atop Little America II

"I am mayor of this place," jokes Admiral Byrd (left). The tip of a 70-foot radio mast in the background marks his 1928-30 base, buried by snows of three decades. Little America II, built in 1934 above the first camp on the Ross Ice Shelf, lies 40 feet below the surface.

Dr. Paul A. Siple (laughing), Admiral Byrd's deputy, has accompanied the explorer on all five of his antarctic trips. He went on the first as a 19-year-old Eagle Scout. Other polar veterans (left to right): Maj. Murray Wiener, Air Force adviser to the Admiral, on his third trip with Byrd; Lt. Richard E. Byrd, Jr., on his second; and Edward E. Goodale, an IGY representative, also on his second.

over personnel, for Pole Station, an IGY-assigned U. S. scientific outpost.

The International Geophysical Year, from July, 1957, through December, 1958, is perhaps the most important cooperative effort of scientists in the history of man. From it we are going to learn a great deal about this old world we've crawled around on for so long.

In the single field of weather, for instance, the antarctic IGY stations will greatly enlarge our understanding of the basic circulation of the atmosphere, and thus improve long-range forecasting. Estimates of the money value of

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this knowledge to workers in construction, forestry, and, especially, agriculture run into the billions.

An increase of good will among peoples will be an almost inevitable byproduct of some 40 nations working together in worldwide collaboration. Typical of this spirit was the heart-warming reception that was given us in New Zealand.

Six days after we sailed from Lyttelton we were crunching through the 400-mile-wide pack with helicopters scouting ahead. *Glacier's* skipper, Comdr. Eugene ("Pat") Maher, smiled approvingly as his burly ship slashed through four-foot-thick ice.

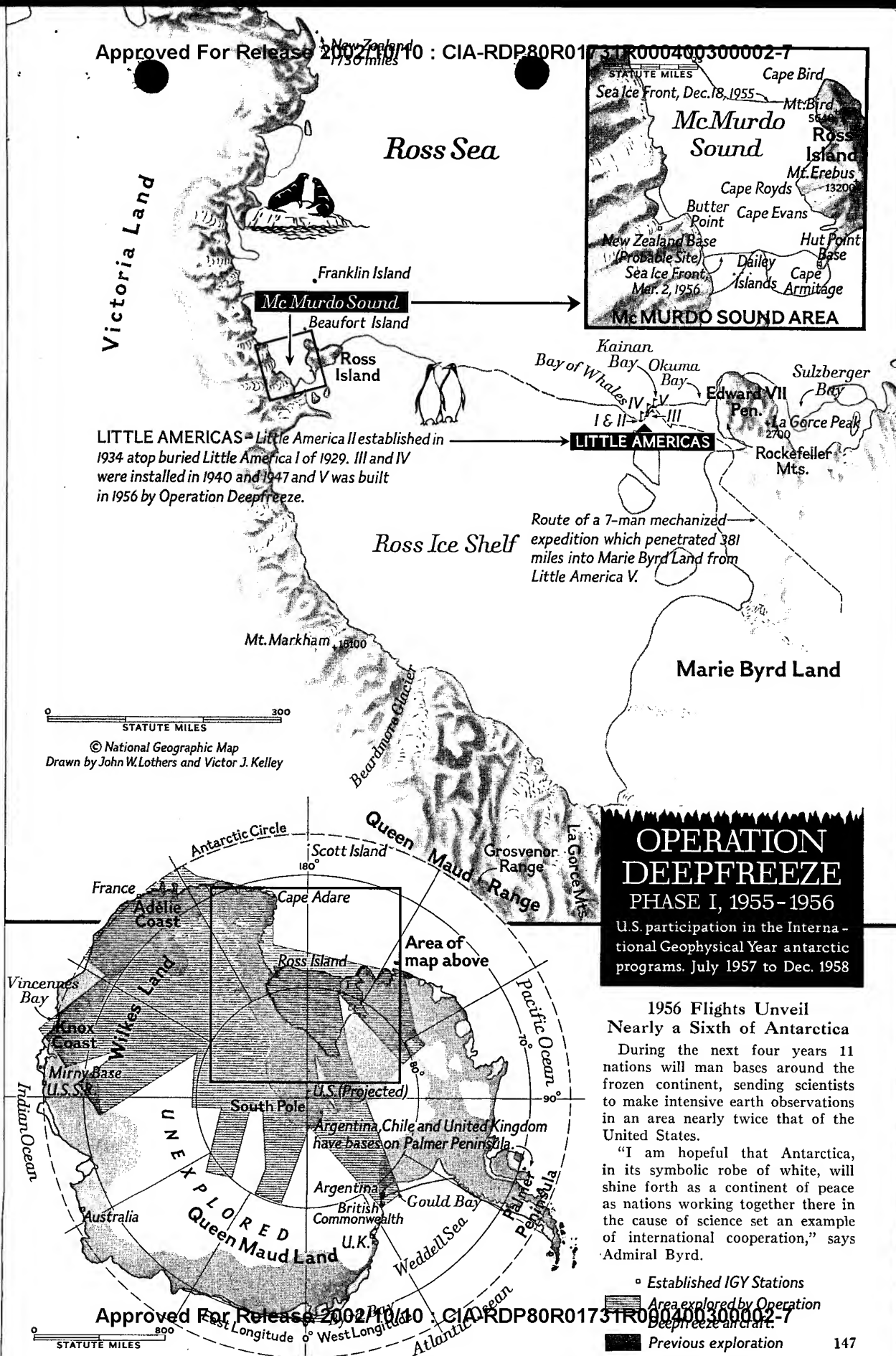
We had reached the world of 24-hour daylight. Often we stayed up all night because there was no night. The sun was a giant lamp swinging in a circle around a blue ceiling.

Seals dotted the ice: a few fat, lazy Weddells, many slimmer, more agile crabeaters, and the occasional voracious sea leopard and rare Ross seal. Adélie penguins, Antarctica's perennial welcoming committee, tobogganed on their stomachs across the ice to escape the onrushing ship (page 158).

On December 17 we shook free of the pack and raced on across the open southern Ross Sea.

Late that evening, through frost haze and wind-torn clouds, we had our first sight of Antarctica—the furrowed cone of Mount Erebus, puffing a plume of steam and smoke (page 143).

Very early the next day *Glacier* rested her scarred gray chin on the hard ice of McMurdo Sound. As the ship's engines fell silent, crew and passengers lined the rails, spellbound by the gleaming peak of Erebus and the blue-gray icefalls cascading off Mount Bird.





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↑ "Mr. Antarctica" Visits Hut Point Airbase

Admiral Byrd (left) has lived and led the 20th-century evolution of antarctic exploration from dog teams and wooden ships to far-ranging aircraft.

In yellow Byrd Cloth parka and trousers, he has come by helicopter to inspect the Deep-freeze air camp on McMurdo Sound and to visit Robert Falcon Scott's 1902-4 base camp, still standing on Ross Island's Hut Point (page 155).

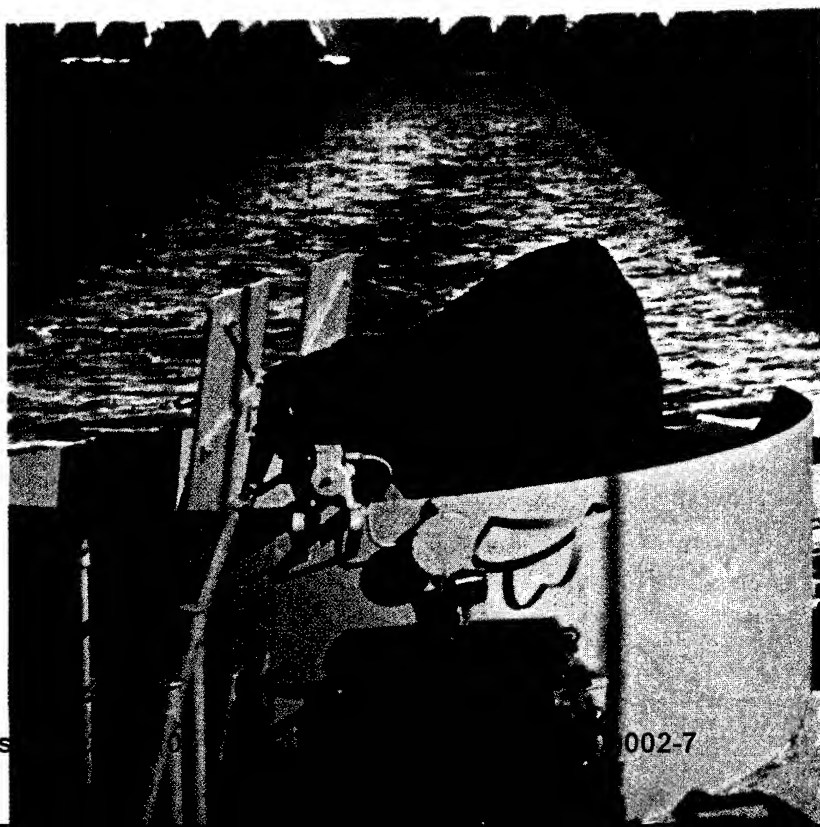
Here Admiral Byrd talks with Air Force Master Sergeant Hendrik Dolleman, veteran dog-team driver of the U. S. Antarctic Expedition of 1939-41.

→ Page 149, above: Dolleman's huskies curl happily near a snow-drifted sled. Though planes now blaze polar trails, rescuing dogs can still mean life or death to downed flyers.

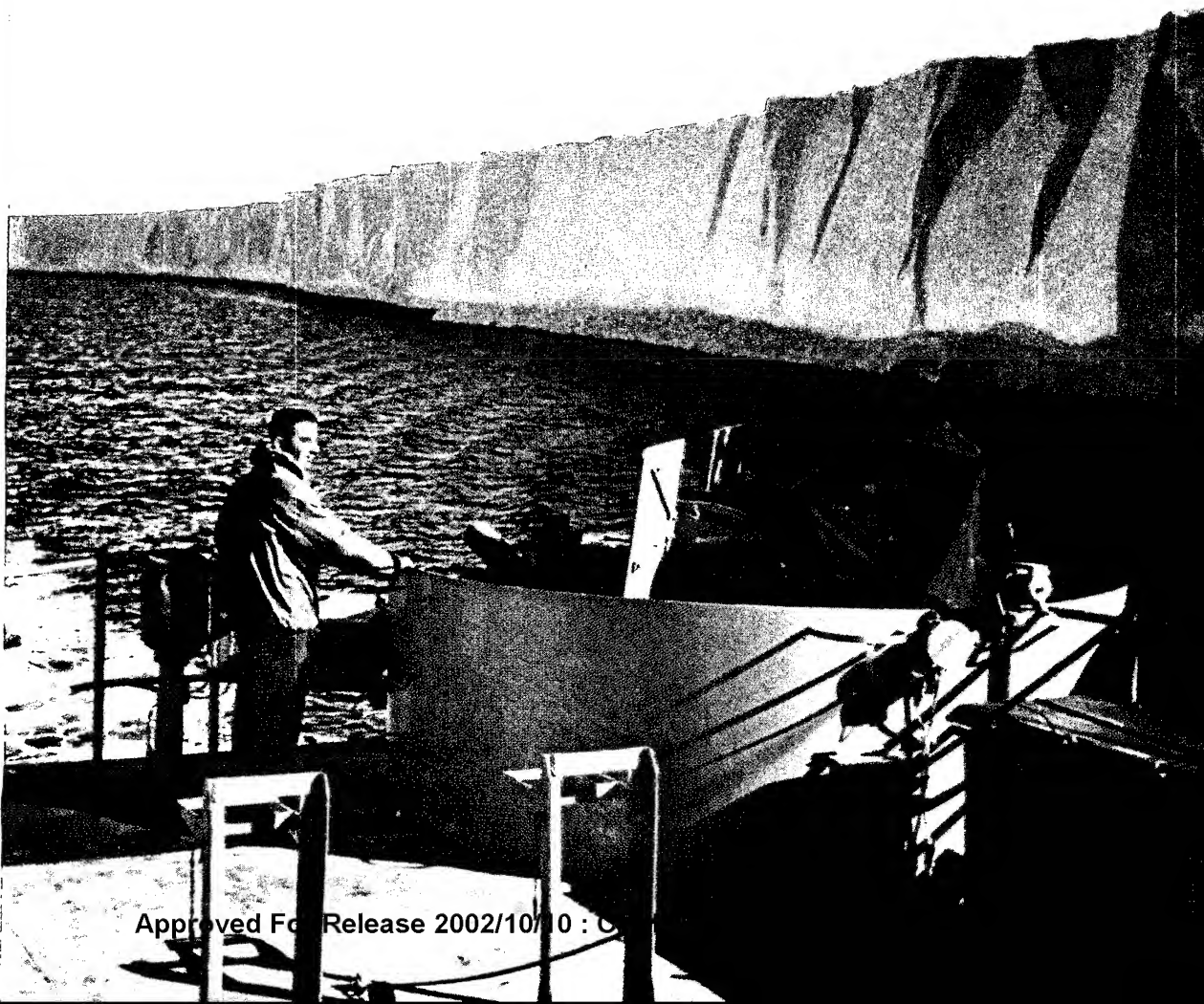
Glacier Skirts a → Mighty Wall of Ice

Four times Manhattan's size, this giant island berg measures nearly 100 square miles. Experts estimated its average height as 125 feet and its depth below water as 750 feet.

The monstrous mesa split off from the Ross Ice Shelf and cruised for 200-300 miles before grounding between Ross and Beaufort Islands.



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Rear Adm. George J. Dufek (Left) Plots the Course South for Task Force 43

Three icebreakers, three cargo ships, and a tanker made up the support fleet for Operation Deep-freeze. Here the Admiral confers with *Edisto's* captain, Comdr. Roger W. Luther (center), and the Deep-freeze base operations chief, Capt. Richard B. Black. The National Geographic map helped mark ship and plane positions on the 2,400-mile course from New Zealand.

We had returned to reawaken the echoes in the region where Scott and Shackleton made antarctic history early in this century.

Getting to Know the Natives

Glacier quickly shed her deckload of over-snow vehicles and one of the expedition's four single-engine Canadian-built de Havilland Otter planes (page 165).

Off-duty shifts played softball on the ice or hiked three miles to the bare, black slopes of Cape Bird to visit a penguin rookery. There 30,000 family-minded Adélies were busy hatching eggs and tending the trembling mouse-gray blobs of fluff that were their

young. Rapacious skua gulls perched and hovered near by, ready to pounce on unguarded eggs and young (pages 158, 159).

Marching penguins made heavy two-way traffic on the crushed-lava slope from ice edge to rookery.

"While one bird tends the eggs, the mate heads for seal holes or the open sea," explained Dr. Oliver L. Austin, Jr., U. S. Air Force observer and ornithologist who was banding penguins and skuas for the U. S. Fish and Wildlife Service. "Here it's a round-trip walk of about five miles.

"Birds come back from salt water full of shrimp. After some affectionate billing and

squawking, the penguins switch places on the pebble nests and the hungry shift takes off for the sea. Both parents feed the hatched young by regurgitation."

The *Glacier* had pushed quickly ahead to McMurdo Sound to reconnoiter an ice airstrip that could receive the eight multi-engine aircraft assigned to Task Force 43. These planes were waiting in New Zealand for the go-ahead on the hazardous 2,400-mile over-water hop.

Airstrip Laid Out on Bay Ice

During Operation Highjump, in 1947, I took part in the successful 800-mile flight of six twin-engine R4D's (Douglas DC-3's) from the aircraft carrier *Philippine Sea* to Little America, a flight led by Comdr. William M. ("Trigger") Hawkes, who flew to Antarctica on Deepfreeze, too, as Aviation Transit Officer.

This new air movement, however, would span a three times greater mileage and would be the first fly-in of big planes to Antarctica from a land jump-off point.

To locate the required airstrip, a team took off from *Glacier* by helicopter. Heading it was Comdr. Gordon K. Ebbe, commanding officer of the air squadron that would put aloft the long-range aircraft.

Thirty-five miles to the south, near Hut Point, site of Scott's first expedition cabin, they red-flagged an 8,000-foot snow strip that could easily handle the biggest airplanes (page 152).

A helicopter flew three of the correspondents to see the newly marked runway, landed them, and took off again. At the snowy strip, hours later, they stamped feet and rubbed nipped cheeks, waiting for a helicopter to pick them up. It was cold and very lonely on windswept McMurdo Sound.

"Well," said one, "we surely ought to make it back to the *Glacier* before dark."

The others nodded agreement—then jerked to attention, realizing it wouldn't be fully dark here for several months.

First New Zealand-Antarctica Flights

News of the airstrip was radioed to Admiral Dufek aboard *Arneb* and to the plane crews waiting in New Zealand. Then the south-bound task force ships steamed to their ocean stations for picket duty at intervals along the flight route. As soon as weather permitted, the historic air hop would be ordered.

Glacier left McMurdo on December 20, heading for her plane-guard station 200 miles north. Half a dozen emperor penguins—three-foot-tall patriarchs weighing 60 to 90 pounds—wagged flippers at us as if in au revoir.

Soon word came that all eight aircraft so vital to fulfillment of our exploration plans were airborne from New Zealand.

The four larger planes, two Neptunes (P2V's) and two Skymasters (R5D's), landed safely at McMurdo Sound that evening. The R5D's were the first four-engine aircraft ever to fly in Antarctica, and the first to land there on wheels alone.

"It's the most miserable flight I ever made," said the pilot of the first plane in, Lt. Comdr. Joseph W. Entrikin. "Oh, it was smooth all right, and we had very little icing up. But it seemed so long, not knowing what to expect, wondering if the weather would hold, and with no place to land but just one spot in the whole continent where there were people on the lookout for us."

What magnificent achievement lay ahead for these airplanes and their crews!

Earlier, to our regret, the four smaller aircraft, ski-wheel DC-3's and Grumman Albatross triphibians, had been forced to return to New Zealand because of adverse winds. Time forbade holding the ships on station for another fly-in attempt.

Plane Crashes Near McMurdo Sound

Soon *Glacier* plowed north to rendezvous at Scott Island with the three cargo carriers and the tanker. Gathering them in convoy column behind her, she led them southward through the loosening pack ice (page 145).

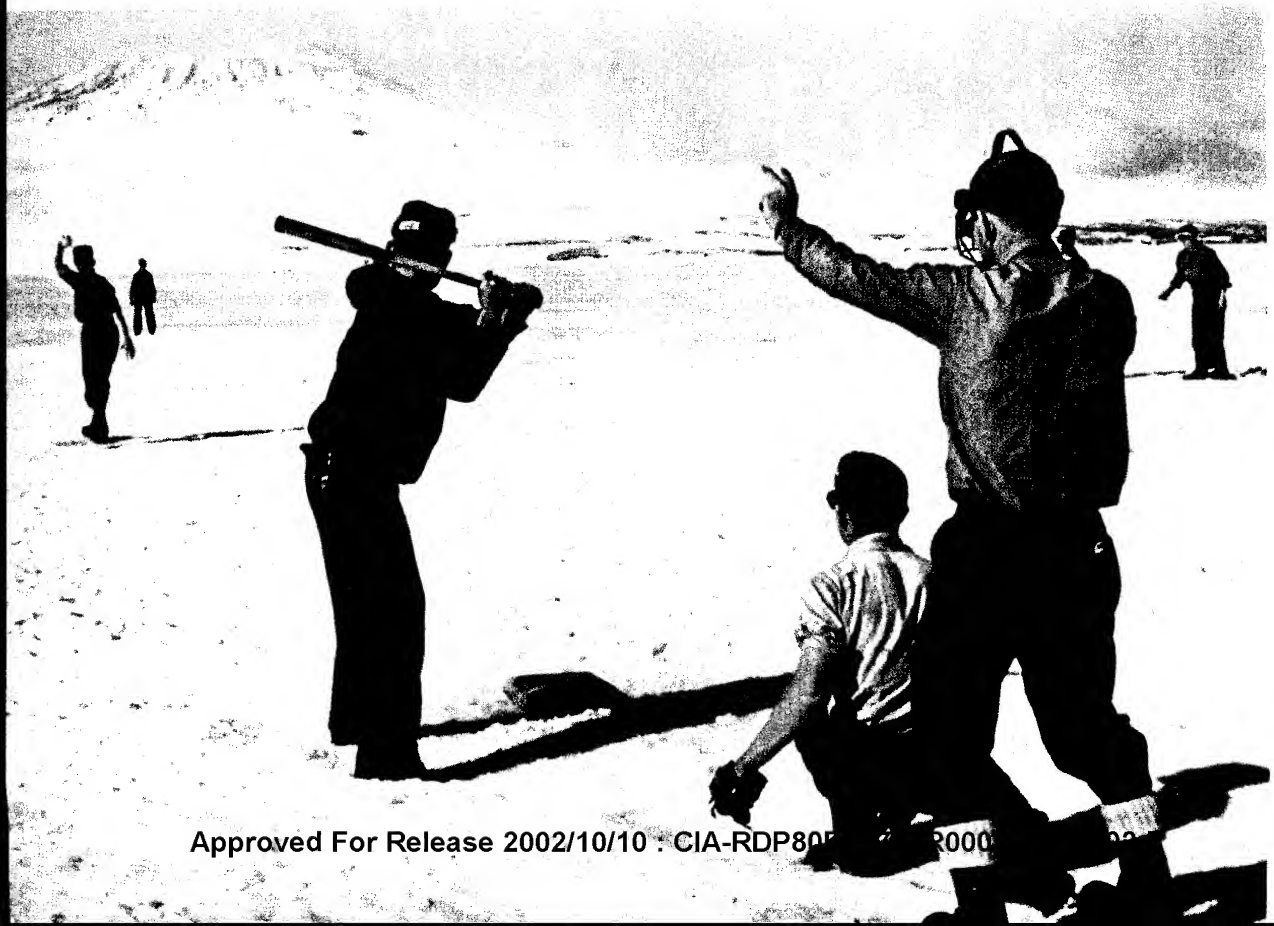
The days just before Christmas were clouded by news of the crash on December 22 of the Otter aircraft unloaded four days before from *Glacier*. But by Christmas Eve all hands got the good news that none aboard had been killed, though one officer was seriously injured and one enlisted man suffered a painful, but soon-mended, back injury.

The small plane, jam-packed with passengers and supplies for Hut Point, had cracked up immediately after take-off from the northern edge of the McMurdo Sound ice.

A weasel snow vehicle at the crash site transmitted an SOS to Hut Point. One of the Neptunes flew to the ice edge and took the injured men to the tent camp.

The base doctor gave first aid. But as yet

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← First Flight to Antarctica from Land Touches Down on McMurdo Sound

Ski wheels reach for a flag-marked runway on snow-carpeted bay ice as a twin-engine Navy P2V Neptune completes a historic flight from New Zealand.

Four planes successfully made the 2,400-mile non-stop hop on December 20, 1955, after *Glacier* had raced ahead to pick a landing site. Two of them—Navy R5D Skymasters—were the first four-engine planes ever used on the south polar continent.

he had neither instruments nor shelter adequate for treatment of his patients.

One of the task force ships had to be summoned. But the camp radio at Hut Point failed to contact the ships at sea.

Commander Ebbe checked his big planes. One Skymaster had about an hour and a half's gas left. (Until a tanker arrived, it was impossible to refuel the planes.)

Radiogram Goes Long Way Round

"Get up there," Commander Ebbe ordered its crew, "and try to contact an icebreaker."

No luck. So the pilot climbed to 10,000 feet, his gasoline rapidly dwindling, and raised a commercial radio station 2,800 miles away in Auckland, New Zealand. When he landed, his plane's tanks held only 30 minutes of fuel.

The Auckland station alerted the ships. *Edisto*, outbound from McMurdo, "did a one-eighty," turned up flank speed, and raced to the crash scene.

When *Edisto* reached the ice on Christmas Eve, 50-knot winds canceled out the take-off of the rescue helicopter. Thirty-three hours ticked away with exasperating slowness before the pilots, Lt. Comdr. Charles Costanza and Lt. (jg.) John Bacon, whirled up to Hut Point and picked up the crash victims.

In the air again, the "choppers" plunged into whiteout conditions, the dread of polar flyers, when ground, sky, and horizon all are lost in a milky haze.

"I felt like a fly trapped inside a ping-pong ball," said Jack Bacon.

But the helpless passengers were safely delivered to *Edisto's* warm sick bay.

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← A Batter Aims at Lofty Mount Erebus

Softball on McMurdo ice makes home seem not so far away on New Year's Day. Under the antarctic summer sun, temperatures sometimes rose higher than on the same days in New York City.

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Christmas at sea was a day of worship and feasting. I was invited to eat Christmas dinner with the crew and enjoyed talking with these fine Navy men.

To *Glacier* from *Arneb* came a message by blinker light: "Radar contact friendly sleigh drawn by eight reindeer led by Rudolph piloted by Kris bearing zero zero zero and flashing continuously 'Merry Christmas.'"

Bound now for Little America, *Glacier* cruised along the face of the fabulous Ross Ice Shelf, or Barrier. This fortresslike white cliff is the seaward edge of a sheet of glacial ice as big as California (page 148).

The Shelf is an amazing feature, a striking example of Antarctica's "living Ice Age." Fed by glaciers pouring into Ross Sea from the continental uplands, it also grows by the deposit of fresh snow on its surface.

Recent dramatic changes in the ice front became evident when we compared the *Glacier's* carefully plotted positions with the Barrier face as charted in 1947. Between Little America and a point in longitude 178° E. a chunk of ice about 200 miles long and 10 miles wide had broken off, a piece as big as Delaware.

I asked Dr. Siple, an expert on puzzles of the Barrier, his opinion on how this happened.

"Probably at quite long intervals—perhaps decades," he explained, "the right combination of tides, storms, and waves, prolonged snowfalls, or perhaps even a cataclysm like an earthquake, must cause multiple breaks along the whole Barrier edge."

Back to Little America

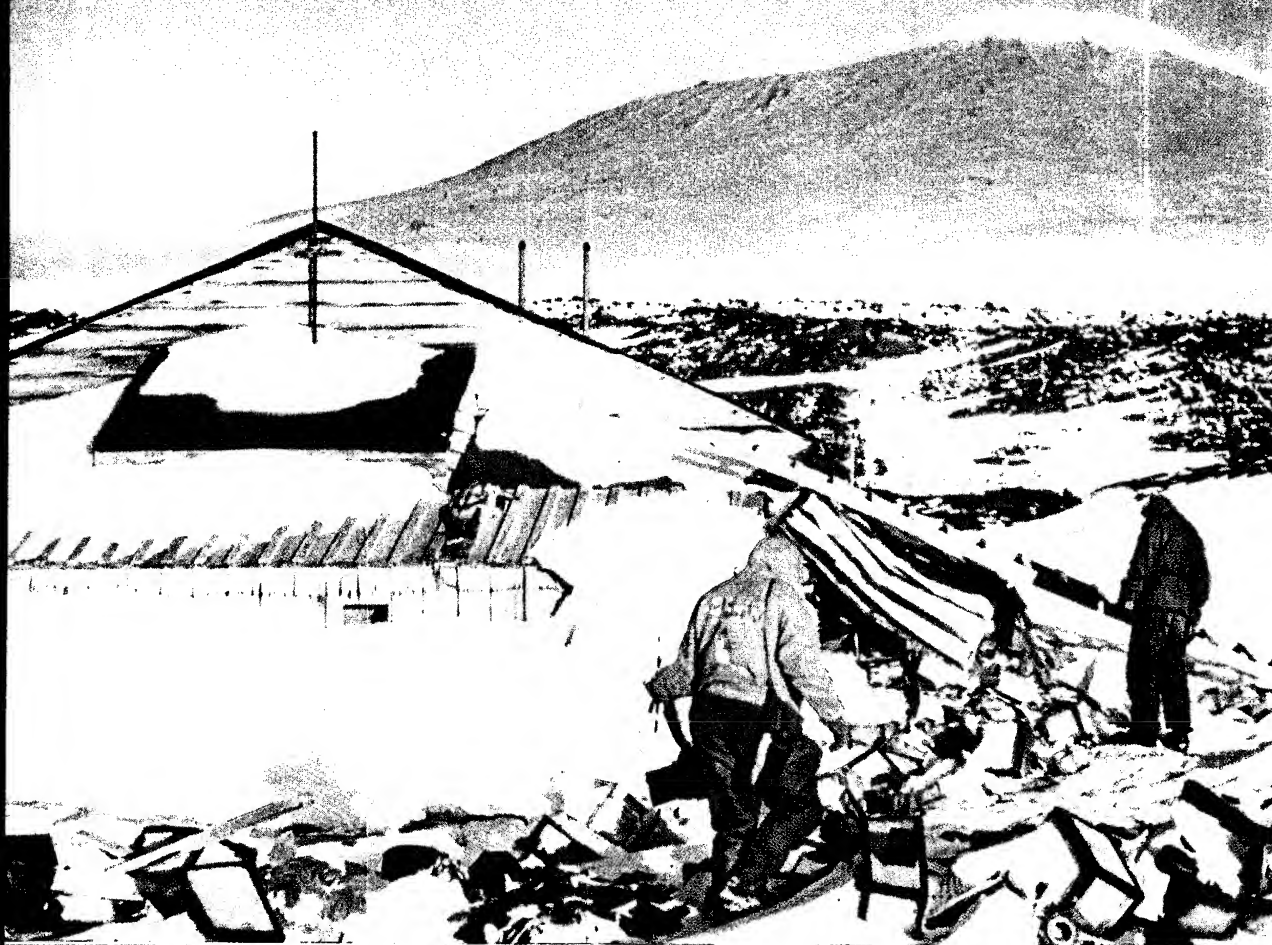
Very early on the clear, cold morning of December 28 we raised the Bay of Whales. Soon, through binoculars, appeared, the tips of radio towers and poles of Little America, deserted since 1947.

At 4 a.m. a helicopter lifted me off *Glacier's* flight deck for a look at the few square miles of ice that have such special meaning for me.

As we fluttered comfortably along, my mind flew back to a scene of sweat and strain that was acted out in this very setting 28 years ago. Vividly I saw in memory the grunting, heaving line of men and dogs that hauled our Ford trimotor plane, its wings removed, five uphill miles across the ice to our first Little America camp.

We buzzed Little America III and IV, where radio poles and tents protruded from the snow, and then alighted at Little America

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Blizzard-beaten Camps of Antarctic Pioneers See Life Again

Three half-century-old huts cling to the black lava shores of Ross Island as monuments to men who dared break the way to the South Pole.

← Britain's Capt. Robert Scott built this camp on Cape Evans in January, 1911. Racing Roald Amundsen for the Pole, he set out southward November 1, never to return (page 175).

Deepfreeze work teams sampled some of the food supplies left by Scott and by Shackleton's Ross Sea party in 1915-16. They tasted English cocoa and curried rabbit, still perfectly preserved.

National Geographic photographer Jack Fletcher (right) looks upslope toward Scott's main supply dump and the South Pole 850 miles beyond.

← Page 154, below: From this hut on Cape Royds, Sir Ernest Shackleton's 1907-9 expedition climbed Mount Erebus and pioneered a route to within 97 miles of the Pole.

Whistling winds, sun, and rocky terrain keep this spot clear of snow.

↓ On Hut Point, at Scott's 1902 base, Admiral Byrd (left) inspects a pickax found lying outside the snow-filled building.

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Ghostly Cabin Filled with Frozen History Waits for Explorers to Finish a Last Meal

Capt. Robert Scott built the hut on Cape Evans in 1911. Last men to occupy it were seven survivors of Sir Ernest Shackleton's Ross Sea party. Shackleton came to their rescue in January, 1917, with the ship *Aurora*. Sailing home, he wrote, "I had the hut put in order and locked up." Thirty-nine years later parties from Operation Deepfreeze were forbidden to enter, but photographer Fletcher aimed camera and flash into the gloom through a broken windowpane and shot a series of pictures. This dramatic view developed, showing the table's wine, bread, and cheese perfectly preserved by Antarctica's natural icebox. A pot stands on the stove ready for cooking. King George V and Queen Mary appear on the wall in precoronation portraits. Snow, choking all but this room, appeared in the dark. This is the last room sealed off by the last expedition to Antarctica.

I and II. There, above the surface, still project three wooden antenna poles and the tops of two steel radio towers, about 10 feet of one and 8 of the other.

Old friends from former expeditions had flown in, too. We raised the American flag and I reminisced a bit (page 146).

"It's great to get back here, with about 10 buildings of my first two camps right under my feet. They're likely to be there for a long time to come, locked away tighter than a mummy in a pyramid, but their contents still well preserved and available if needed....

"You know, these radio towers were 70 feet tall when we put 'em up in 1929. When we came back in 1934, the first base was completely buried. We just put the second one down right on top of it."

A knife-edge wind sliced in from the south across 400 miles of unbroken ice. The temperature was four or five below zero. White snakes of ground drift hissed across the snow. And this was midsummer!

Towers and poles only accented the abandoned feel of the place. The men, wandering about in their bright parkas, seemed like bewildered visitors from another world.

In relays we hopped back to the ship, hungry both for warmth and for breakfast.

Old Site Ruled Out

It seemed doubtful whether it was worth while to try to establish our new base in the Bay of Whales. Sometime between 1948 and 1954 the ice capes enclosing the once bottle-shaped bay had broken out. In most places sheer white cliffs precluded putting ships' cargo on top of the Barrier. I felt certain we would find better locations to the eastward.

In Kainan Bay, 30 miles northeast, Paul Siple found the right combination: bay ice for unloading, gently sloping snow ramp to the Barrier summit, and a ridge of Shelf ice to support the buildings and give their tenants a view over Kainan Bay and the Ross Sea (page 166).

Glacier broke out an ice harbor 1,000 yards wide and 1,200 long. The supply ships *Arneb* and *Greenville Victory* tied up and began discharging cargo. From *Greenville Victory* Capt. Stevan Mandarich, USN, came aboard *Glacier* to join me as my chief of staff.

Probing showed up many ice cracks and crevasses along the five-mile route between open water and base site. Most were drifted over with snow, but one crevasse was a gap-

ing turquoise slit 60 feet deep and 25 to 30 feet across.

Under Army Warrant Officer Silas Bowling, with years of experience bridging crevasses on the Greenland Icecap, Seabee teams spanned bay ice cracks with aluminum bridges that could support 70 tons. They dynamited crevasses in the Barrier fringe. Drivers brought up 35-ton D-8 tractors rigged with bulldozer blades and shoved hundreds of tons of snow into the beautiful but treacherous mantraps there and farther inland (page 180).

Within ten days of the first landing, tractor trains already had delivered hundreds of tons of construction materials to the base site and to a temporary dump on the bay ice.

Shore Parties Greet 1956

The ships celebrated New Year's Eve with gala shore parties. Colored flares flamed wanly in full daylight. Men wearing tissue-paper hats and false noses chanted, with monotonous logic, "We're here because we're here, because we're here because we're here!"

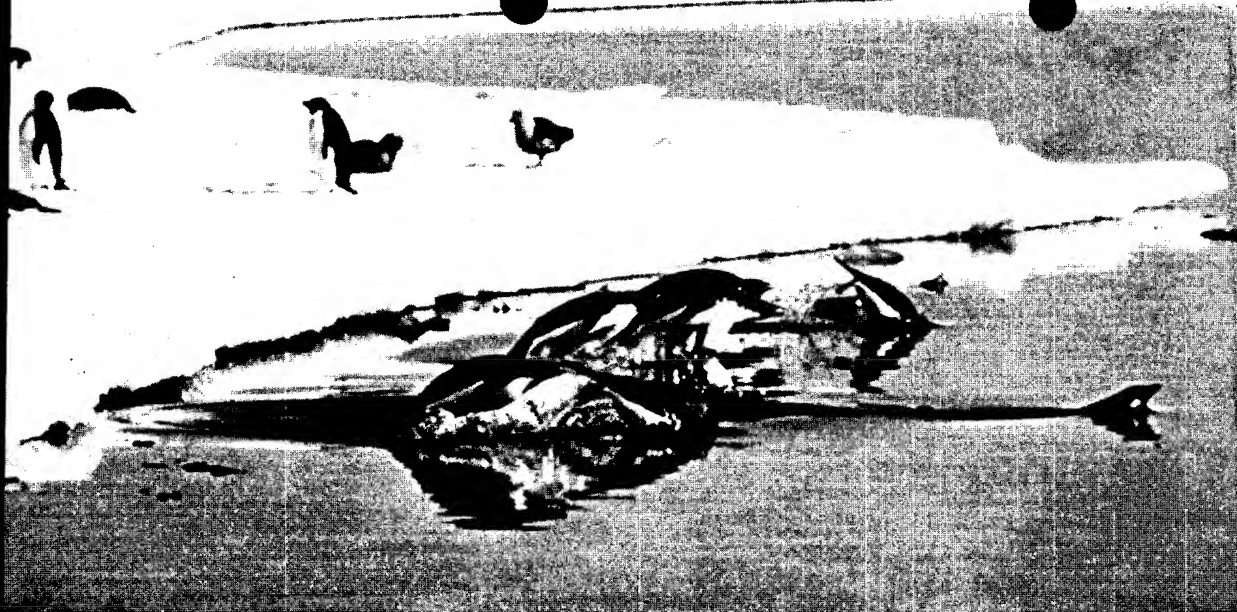
On January 4, 1956, I joined Admiral Dufek in the formal dedication of Little America V. Here would arise 17 bright orange buildings, chief structures of the 73-man base (pages 166 and 168).

On the way to the flag-raising ceremony, my Sno-Cat broke down and Amory ("Bud") Waite, Army Signal Corps representative, picked me up in one of his weasels. Bud was one of three men who saved my life in 1934, rescuing me from my solo vigil 123 miles by trail inland from Little America after I had been badly poisoned by carbon monoxide fumes.

During Deepfreeze I, Bud Waite made valuable studies of radio wave propagation in snow and ice. He confirmed that snow, unlike water, won't short-circuit a copper antenna wire laid across its surface.

In the snow, Waite and his men dug two pits 20 feet deep and a mile apart. Even with very low-power equipment, they were able to talk easily by radio through the intervening barrier of hard-packed snow.

In his "cosmic ray shack" on *Arneb*, Rochus E. Vogt, of the Enrico Fermi Institute for Nuclear Studies of the University of Chicago, kept busy mapping the force of the earth's magnetic field and taking fixes on the geomagnetic equator in outer space. He did this by interpreting the influence of the earth's magnetic field on cosmic rays.



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Andrew H. Brown, National Geographic Staff

Adélie Penguins Leap from Beneath the Ice Like Porpoises in Boiled Shirts

Clown princes of their frozen kingdom, Adélies rollick at ice edge like boisterous children. Inordinately curious, they scolded Deepfreeze ships, craned necks at man's odd labors, and waddled into sailors' softball games. A skua gull perches on the ice; his kind regularly steal penguin eggs and newly hatched young.

Vogt's dozen cosmic ray counters, embedded in paraffin and separated by massive lead blocks, received the cosmic radiation produced by high-energy particles. *Arneb's* route in antarctic waters, and bound to and from them, allowed Vogt to make tangent readings that accurately located the geomagnetic equator. Knowledge of the geomagnetic field in outer space, among other values, is useful for precise aiming of ballistic missiles.

Other scientists pursued their researches in many fields. Ornithologist Austin banded thousands of penguins, and one of the hydrographers dredged up a sea worm 30 feet long.

"Heat Wave" Brings Crisis

After *Glacier* left to return to McMurdo Sound early in January, there arose at Little America V a major emergency. Later I heard the story from Comdr. V. L. Pendergraft, Task Force Air Operations Officer.

"To speed off-loading, we took a chance on setting up that big supply dump you saw growing on the Kainan Bay ice close to the Barrier," he said. "As fast as equipment came out of *Arneb* and *Greenville Victory*, tractor trains hauled it to the halfway dump. Seabees piled up the stuff by the hundreds and hundreds of tons, despite the calculated risk involved in trusting it to the bay ice.

"Then an antarctic 'heat wave' moved in. Temperatures rose to the freezing point.

"On January 7 surveyor Frank Biba, sighting through his theodolite, saw the ice edge heaving up and down. What if everything we'd off-loaded—supplies, tractors, Sno-Cats, aircraft—were lost to Davy Jones?

"Admiral Dufek, against the advice of some, at once ordered every box, crate, drum, and bundle in the supply dump moved to the base site on the Barrier within 48 hours. By now the ice the surveyor had seen quaking was nothing but a jumble of tossing ice cakes."

All hands turned to, many spurred by the danger of losing the means of their survival over the long antarctic winter to come. A day and a half of fierce exertion—and every stick of equipment was safely relocated on the Shelf ice.

In a howling storm of blowing snow, vehicles and loose equipment near the ice edge were hauled back aboard ship (page 164).

Within hours after the move, wind and seas licked Kainan Bay clean of the last bay ice. The natural float that had supported the supply dump was entirely gone.

McMurdo Ice Claims a Life

The ships moved in and tied up to the face of the Barrier at a low point almost at deck level (page 162). Officers and men, the crisis weathered, were wiser for their experience. Moral: Young bay ice is fickle stuff, never to be trusted.

Hardly had *Glacier* returned to McMurdo Sound when a man died almost within sight of our decks. Seabee Construction Driver 3d Class Richard T. Williams, of Iliion, New York, had just jockeyed his 28-ton D-8 tractor across a bridged crack in the bay ice opposite Cape Royds and moved on about 20 feet when the ice suddenly split all around it.

The metal monster slid out of sight, and driver Williams with it. The water was 100 fathoms deep. There was nothing anybody could do.

Later the new Navy airbase in McMurdo Sound was named Williams Air Operating Facility in honor of this faithful young Seabee.

In happy contrast to this tragedy was the safe completion of the aerial exploration program. In 10 spectacular flights from the McMurdo Sound ice, between January 3 and January 14, U. S. Navy long-range planes of Air Development Squadron Six observed approximately 800,000 square miles of Antarctica previously unseen by human eyes. That means more than a fourth as much territory as there is in all the United States.

A series of short, preliminary flight-familiarization hops was called by the pilots "fright-familiarization."

The air tracks of the two Skymasters and two Neptunes fanned out across the heartland of the continent. Four of the flights crossed the South Pole.

Jack Fletcher, National Geographic photographer, had the distinction of taking part in a flight that found the highest area yet discovered on the white glacial dome of Ant-

arctica's hinterland. An area near latitude 82° S. and longitude 55° E. humped up to about 14,000 feet (map, page 147).

I had expected to find this high land because of the furious and continuous south winds that ships and land parties have bowed before on the Adélie Coast of Wilkes Land. Nevertheless, this discovery was a most worth-while geographic find.

The Australian, Sir Douglas Mawson, a great scientist and my good friend, as long ago as 1912 reported 90-mile winds blowing there for days, with gusts hitting 200 miles per hour. Other explorers confirmed these gales, which revealed a sharp contrast with the situation at Little America. There 14 mph was the average for the windiest month, and 75 mph was the strongest recorded wind.

Ice Dome Helps Solve Wind Mystery

From the observations of the various plane crews Siple deduced that a shallow trough lies between the tall mountains of Victoria Land, some of which reach up to 15,000 feet, and the high dome found by our planes in central "East Antarctica."

Sloping down evenly from near the South Pole toward the Adélie Coast, this wind chute spills out cold air from the ice plateau. Gaining speed from the pull of gravity as it pours downhill, the air reaches the sea as a screaming antarctic gale.

Saul Pett, Associated Press correspondent, became the first newspaperman to fly over the South Pole. Pett won local fame for his lively sense of humor. Once, sharing with other cor-

An Antarctic Ambassador Erupts from the Depths

Black-and-white Adélies pop comically from water to ice with the suddenness of watermelon seeds squeezed from fingers, yet maintain an erect stance worthy of a diplomat in full dress. They size up the ice edge from 20 to 30 feet away, rush at it under water, and shoot up to land feet first on the snow.

John E. Fletcher, National Geographic Staff



respondents a temporary drop in morale, Pett suggested, "Let's go out on the ice and build snowwomen."

The summer's first transcontinental sweep was a 3,000-mile flight across Wilkes Land to the Knox Coast and back. The plane swung within distant view of the area where, a few days later, the Russian IGY expedition began setting up its Mirny Base. Other flights crossed areas where the U.S.S.R. plans to build inland bases.

"SOS, SOS, SOS!" brought the air operations room aboard the *Wyandot* to tense alert in the late evening of January 6. The distress call came from Lt. Comdr. Joe Entriakin. His Neptune was 1,200 miles out from McMurdo.

Entriakin reported his starboard engine failing. Power output was wavering as revolutions per minute fluctuated wildly. The crew jettisoned bomb bay fuel tanks and stripped the airplane of everything but essential radio and survival gear.

What a relief when radar spotted the cripple 100 miles away, staggering in over the 10,000-foot mountains west of McMurdo Sound!

Ten minutes from the airstrip, the starboard engine failed completely. But the pilots made a perfect single-engine landing.

No wonder crews sometimes referred to these hazardous air journeys as "long-range missions"!

The aerial survey program ended with a tremendous transcontinental effort in which "Trigger" Hawkes and his teammates flew a Neptune from the Ross Sea to the Weddell Sea and back. The 3,200-mile trip was the longest flight yet made in Antarctica.

Third Time to the Pole

To me, of course, my own flight to the Pole—my third—stands out with special vividness.

We took off from McMurdo Sound, and our first goal was the so-called "area of inaccessibility," the heart of the United States-size section of "East Antarctica" that, until this year's survey flights, never had been seen by man. I also wanted to go to the South Pole to inspect the surface of the snow and névé there to get an idea of what conditions may be found by the plane, or planes, that will have to land the Pole Station construction personnel this fall.

With me rode Paul Siple, who has been asked to take charge of the U. S. base to be built at the Pole.

During the long flight we kept checking the navigator's headings with the same Bumstead sun compass we used in 1929. This simple but ingenious device was invented by Albert H. Bumstead, first Chief Cartographer of the National Geographic Society.

At a point 20 minutes beyond 85° S. and 90° E. we began to ice up and flew into a thickening whiteout. So we headed for the Pole, the visibility improving en route. Each time I've approached the Pole from a different direction. This time we came in along the 90th meridian, east.

It's quite easy to find the Pole when the sun is visible. Using the periscopic sextant, we took a true south heading. From tables we knew the angle of declination of the sun south of the Equator at the Pole for the day, January 8. When the sextant showed the sun's altitude above the horizon equal to its declination, we would be over the Pole.

Plane Overshoots the Target

The trouble was that broken clouds interfered with our sun fixes, and we overshot the Pole by 17 minutes. But we promptly backtracked and soon hit our almost featureless target, hub of the vast flat snow field of the polar plateau.

Our altimeter reading, plus radar, confirmed the Pole's elevation at about 10,000 feet.

We circled the Pole three times, the first time any of us had made three round-the-world trips in 10 minutes. Naturally we kept crossing the international date line (180° east and west from Greenwich).

"How should we count this on per diem?" quipped Commander Ebbe, squadron CO along for the ride.

We dropped an American flag and a brown paper bag signed by all of us and stuffed into a piece of pipe. The crew chief threw out four pennies.

Pilots of other expedition aircraft had reported the Pole blanketed with snow so soft

(Continued on page 169)

Page 161

"Chopper 81" Lowers a Skyhook → for a Ship-to-air Pickup

Six Sikorsky helicopters gave Operation Deepfreeze unprecedented mobility, shuttling staff officers between ship and shore, delivering cargo, and serving icebreakers as lookouts.

This whirlybird hovers above icebreaker *Edisto's* landing platform to hoist canvas cargo bags.

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↑ Gray Ships Moor to an Ice Wharf Carved in Kainan Bay

Admiral Byrd landed supplies for four previous Little America expeditions at the Bay of Whales, a natural bight in the Ross Ice Shelf, or Ross Barrier. Since 1948 a vast ice section has split away, taking with it a small part of Little America IV and leaving sheer ice ramparts.

For Little America V, icebreakers sought another landing spot with a gentle slope for hauling supplies to the Barrier top. They found it in Kainan Bay, 30 miles northeast of the Bay of Whales. With 21,000 horsepower behind its blunt nickel-steel bows, *Glacier* chopped a harbor in the 6- to 8-foot-thick ice apron.

Here *Arneb* (left) and *Greenville Victory* flank *Glacier*, carrying Little America's share of the 9,200 tons of supplies brought for U. S. antarctic bases. Unloading begins under a bright midnight sun. Sno-Cats and weasels scratch the first curving tracks across wind-streaked snow.

Ice floes drift seaward toward a double horizon formed by low-hanging clouds, their dark undersides reflecting the sea in a polar "water sky." Navigators in pack ice watch for such a sky to spot open water. A cotton-white overcast, or "ice blink," reveals snow-covered ice fields.

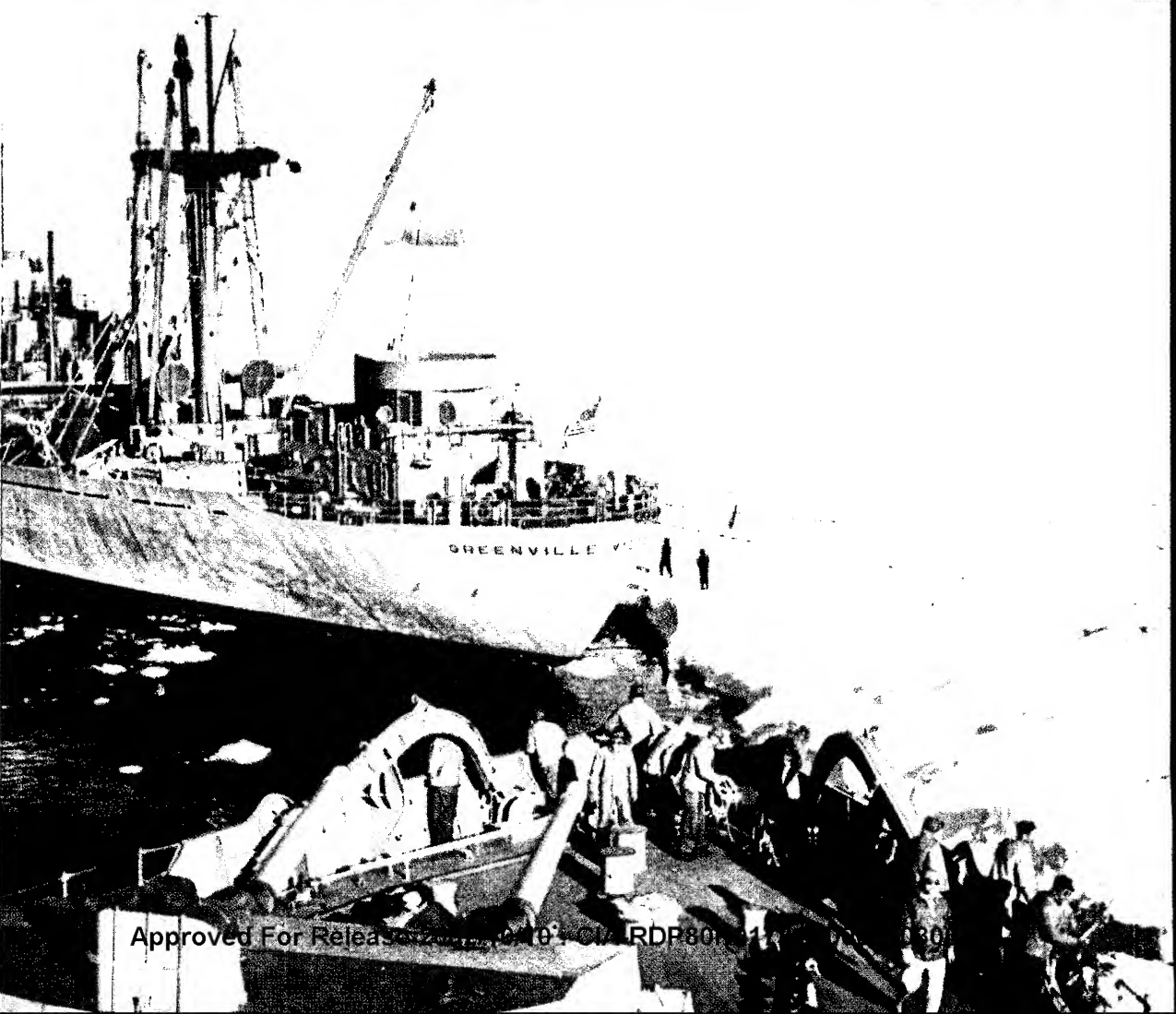
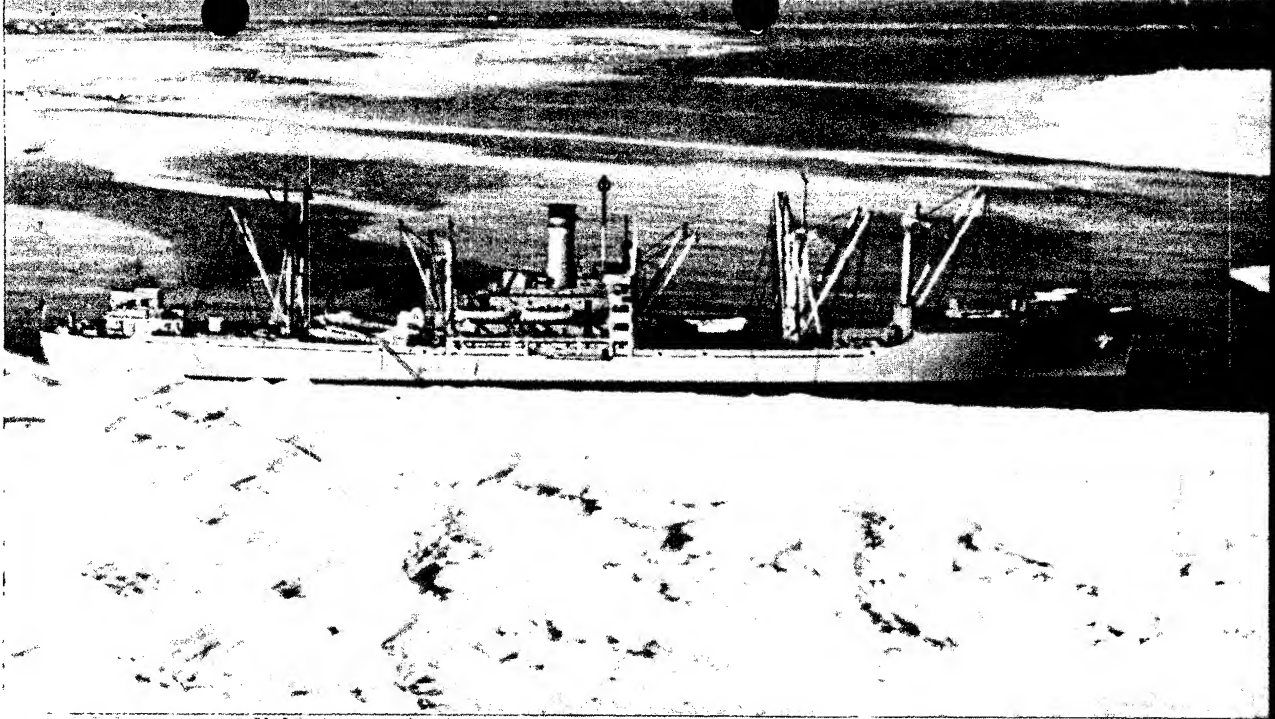
Two Miles of Bay Ice Pave the Way → to the Jutting Barrier Cliffs

Little America's first heavy equipment was unloaded with extreme caution, for the relatively thin ice of Kainan Bay floats over more than 1,000 feet of water. Before the work was finished, the ice broke up in a storm (page 164). Ships scurried to the safety of open water, then returned to tie up directly to a deck-high section of the Barrier.

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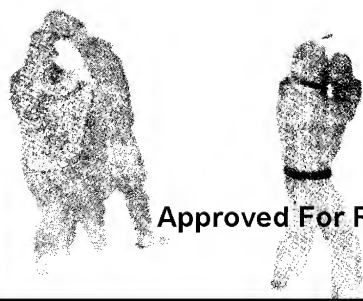
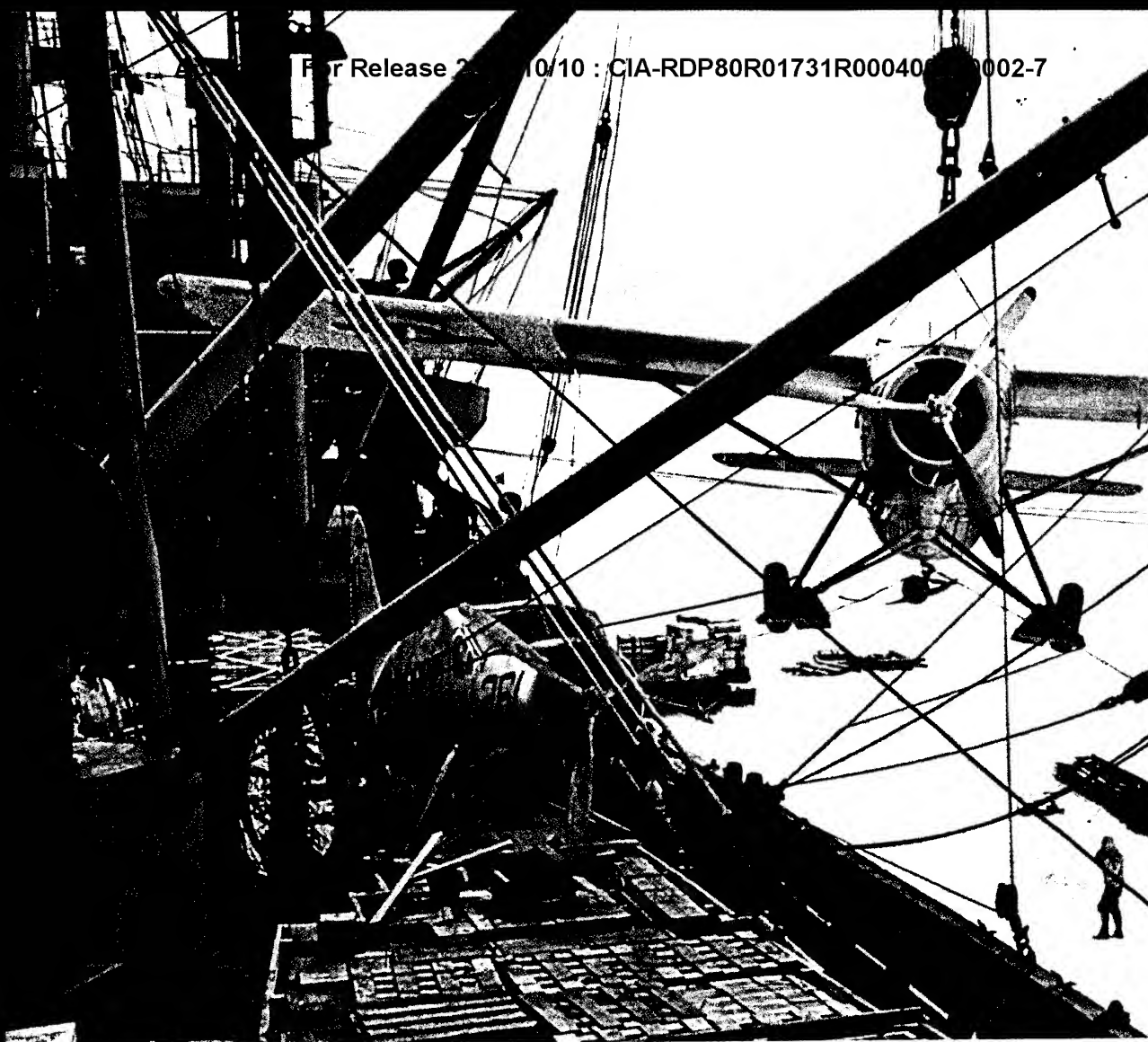


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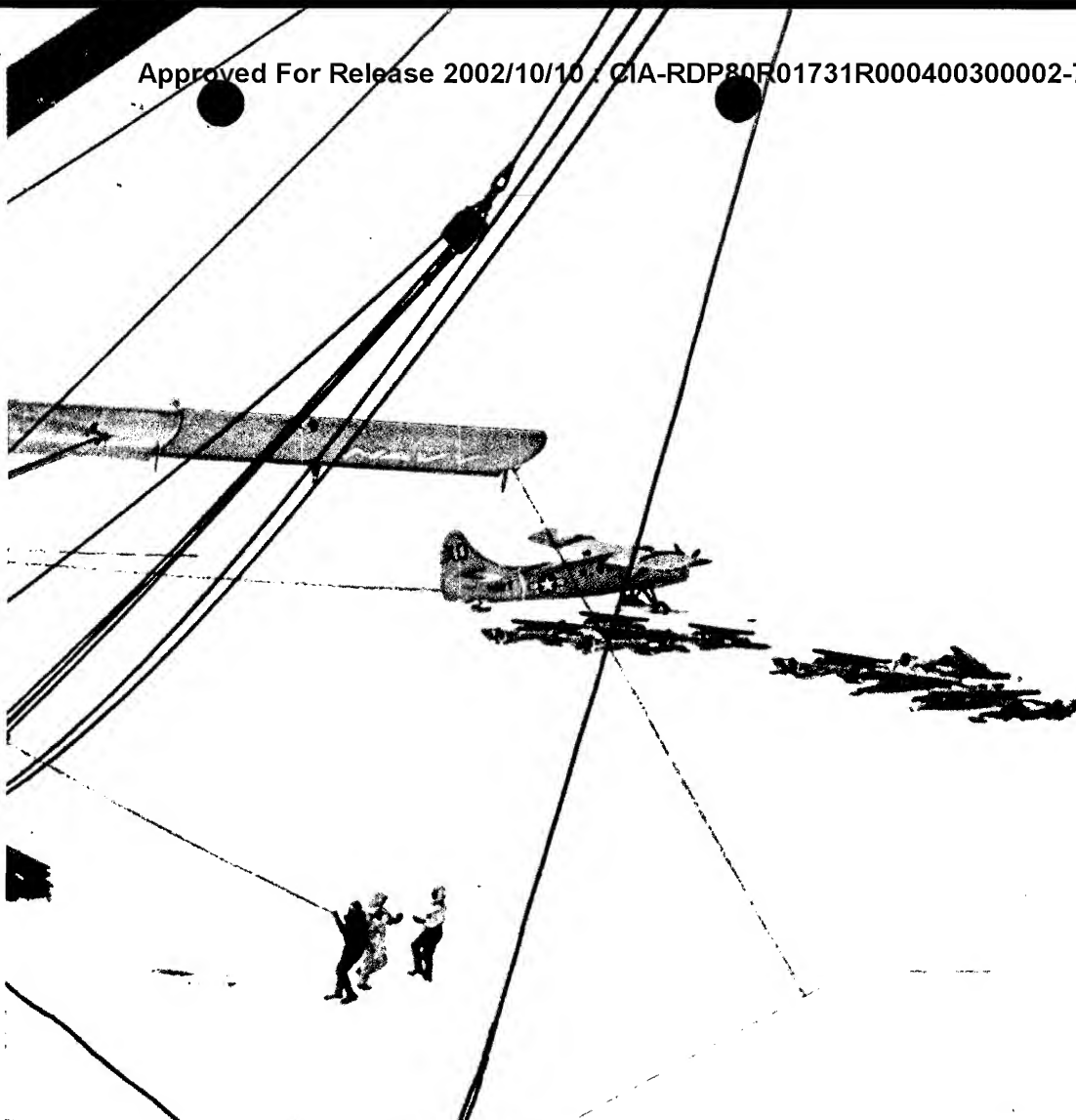


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↑ **Cargo Booms Swing Canadian
Bush Planes into Antarctica**

Bad luck dogged the de Havilland Otters used in Operation Deepfreeze. One dropped when an unloading rig buckled, and another crashed taking off from McMurdo Sound. A third pancaked in soft snow on Edward VII Peninsula.

← **Lashed by a Snow-filled Gale,
Crewmen Battle to Save Supplies**

Page 164: When cracking ice threatened a temporary supply dump on Kainan Bay, thousands of tons of gear were rushed to the Barrier. The last vehicles came back aboard ship just as the blizzard struck. Hours later wind and raging seas had swept the bay clean.

Cary-Lifts were jacks-of-all-work, hoisting heavy loads, stacking cargo, and shoveling snow.

→ Amid blowing snow a work gang struggles to lead out a line to a loaded cargo sled. Spare sled runners stand in the foreground.



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World's Southernmost Town Takes Shape at Little America V

The main U. S. antarctic base for scientific work in 1957-58 springs from a vast jumble of supplies. Navy Seabees erected bright orange cubicles in hours from prebuilt panels and girders.

For morale of a 73-man party left here to spend the antarctic winter, "L.A." stands on a slight rise overlooking Kainan Bay. Farther inland, only snow and sky meet the eye in every direction. Beyond a row of parked sleds, *Edisto* nudges the distant ice edge.

→Page 167, below: Visitors from *Edisto* stroll L.A.'s "Whitney Lane," named for Seabee Comdr. Herbert W. Whitney.

↓Stars and Stripes go up before construction begins. Side by side, Admiral Byrd (in caribou-skin suit) and Admiral Dufek salute.

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John E. Fletcher, National
Geographic Staff, and (lower left)
Comdr. Vernon L. Pendergraft, USN.

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as to preclude a plane landing either on skis or on wheels. Our findings differed. We flew very low and concluded that the snow surface looked firm enough to land on. This was indicated by the crisscrossing and fan-tailed form of the sastrugi, or snowdrift pattern.

Our homeward flight track shadowed the route by which Captain Scott trekked back from the South Pole in 1912 and perished with his four companions.

What changes two generations had wrought! Where Scott and his ill-fated trail mates man-hauled heavy sleds, we rode past at three and a half miles a minute with the security of four engines and magical new electronic navigating equipment. Tea was served at intervals.

Inland Glaciers Have Shrunk

At the head of the majestic Beardmore Glacier, route of both Scott and Shackleton to the polar plateau, we found the mountains bare over broad areas. And from the upper Beardmore, blue ponds, completely ice-free, winked up at us. Many of the bowl-like mountain cirques were empty of ice.

Paul Siple agreed with me that these features gave evidence of slight glacial withdrawal—or at least snow starvation—in this area. Certainly glaciers here once had greater extent.

At 10:30 on the evening of January 8 we landed smoothly at the Hut Point airstrip. In 11 hours and 10 minutes we had flown 2,310 miles. I had never before made a polar flight under such comfortable conditions.

Apart from two ranges of mountains found west of the Victoria Land peaks, and other ranges discovered inland from the Weddell

Sea, our wide-reaching surveys brought to light no important new land features. What our eyes and aerial cameras mostly viewed was a relatively featureless waste of snow, level or gently tilted over the high heart of the continent, crevassed and splitting into glacial tongues at the margins.

By mid-January the four big aircraft had completed much of the work they came south to do. Furthermore, the frozen runways that had served so well were softening up and cracking. Besides, they lay in the path of unloading operations.

On January 18 the planes flew uneventfully back to New Zealand for further staging homeward to the United States.

Stubbornly the ice clung to McMurdo Sound, impeding week after week the transfer of materials for building the Air Operating Facility at Hut Point. This "Airopfac" will be the staging base for installation next season of the South Pole scientific station. It also will support the Pole outpost throughout the IGY program.

But the return of *Glacier* changed the picture. Within two days the rugged ship ground out a 20-mile channel through hard 6-foot ice to within about 10 miles of Hut Point. Captain Maher handled the ship superbly.

Icebreakers as Cargo Ferries

This pathway, unfortunately, was jammed with ice rubble that would quickly put holes in the cargo ships' thin sides. By necessity the icebreakers became cargo ferries. At the edge of open water the freighters off-loaded onto the icebreakers' helicopter flight decks (the helicopters temporarily perching on the ice). *Glacier*, *Edisto*, and *Eastwind* took turns moving up "the slot," soon hacked out to within five miles of Hut Point. They boomed off their loads directly onto giant cargo sleds lined up on the ice.

"The toughest ice operation in polar history," Admiral Dufek called it.

Fortunately, as the summer waned, the bay ice kept breaking out. Once, within three days, McMurdo Sound sent to sea giant ice pans covering 350 square miles, an area as big as New York City.

All of us on board *Glacier* watched with awe as the ship smashed solid, unbroken ice. Against the sides great blue slabs heaved up on edge (page 170).

The undersides of the floes were spread with plankton, brown as peanut butter.

Page 168

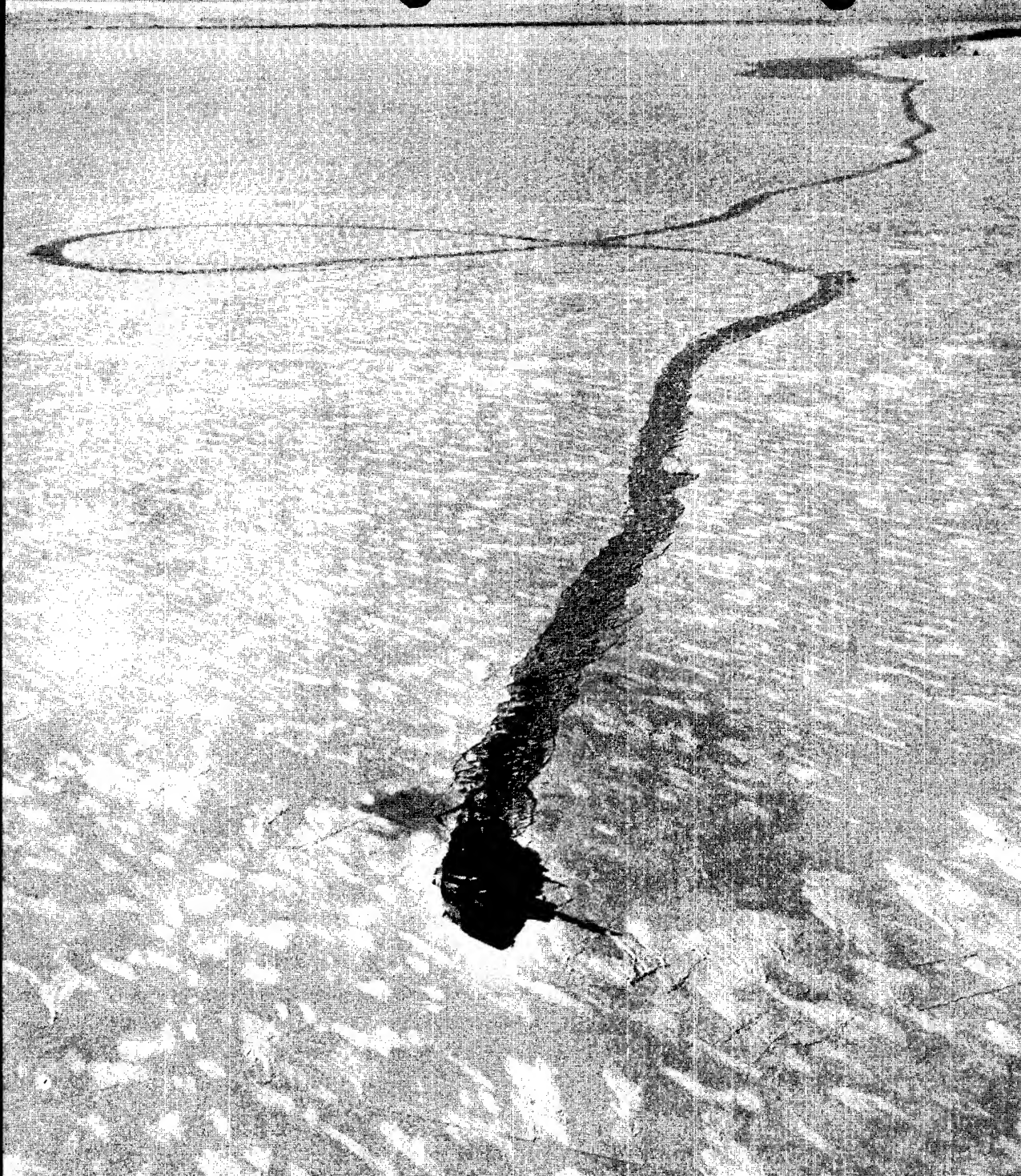
← Seabees Play Polar Dominoes on a Table of Snow and Ice

Deepfreeze huts, designed for 100°-below-zero temperatures and 100-mph winds, are refrigerators in reverse, keeping heat in and cold out. Skylights are the only windows at Little America. Winter blizzards will bury the base to the eaves, but furious winds will sweep flat roofs clear until, years from now, snow engulfs all. Silvery structure is an aluminum test building. Helicopter parks on the snow.

Before March storms struck, outside stores had to be carefully stacked and marked with flags. Eventually all supplies except fuel were placed indoors or in snow caverns branching from burlap-and-wire-walled tunnels connecting the buildings.

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U. S. Navy, Official

↑ **Smashing Through Ice Six Feet Thick, *Glacier* Batters Down Antarctica's Guard**

The 10-engined *Glacier* fulfills a motorist's dream for solving traffic jams: she backs off and charges headlong. Advancing a few yards, she shudders to a halt, retreats, and rams ahead again. In heaviest going, the ship's slanting bow slides up onto the ice, crushing it by the sheer weight of her 8,625 tons. Crewmen compare ice-breaking to riding a runaway bus over a hummocked, corkscrew road.

Here, forced off course by a stubborn stretch, *Glacier* plows a looping furrow up McMurdo Sound toward Hut Point. Thin-skinned cargo ships, moored far behind, could not come up the floe-choked channel. Icebreakers ferried supplies to waiting tractor trains. "The toughest ice operation in polar history," said Admiral Dufek.

→ Water and ice are the toughest enemies in Antarctica.

"During continuous daylight of the antarctic summer," Eddie Goodale, a polar veteran and an IGY representative on Deep-freeze, explained to the men, "dark-brown plankton, drawn by sunlight, accumulates on the underside of the bay and sea ice.

"The sun's rays easily penetrate the snow and ice. The plankton, absorbing the heat, concentrates warmth on the bottom of the ice. So, except in the warmest weather, ice melts more quickly there than on top. During the sunny period, therefore, ice that seems hard on the surface often is dangerously mushy underneath, ready to break up at the first strong wind."

After the middle of January the Hut Point base grew apace. When I flew up there early in February, I found a cluster of tight and spacious buildings perched proudly on a black

bluff overlooking the cape where Scott's storm-buffed 1902 cabin still stands (page 175).

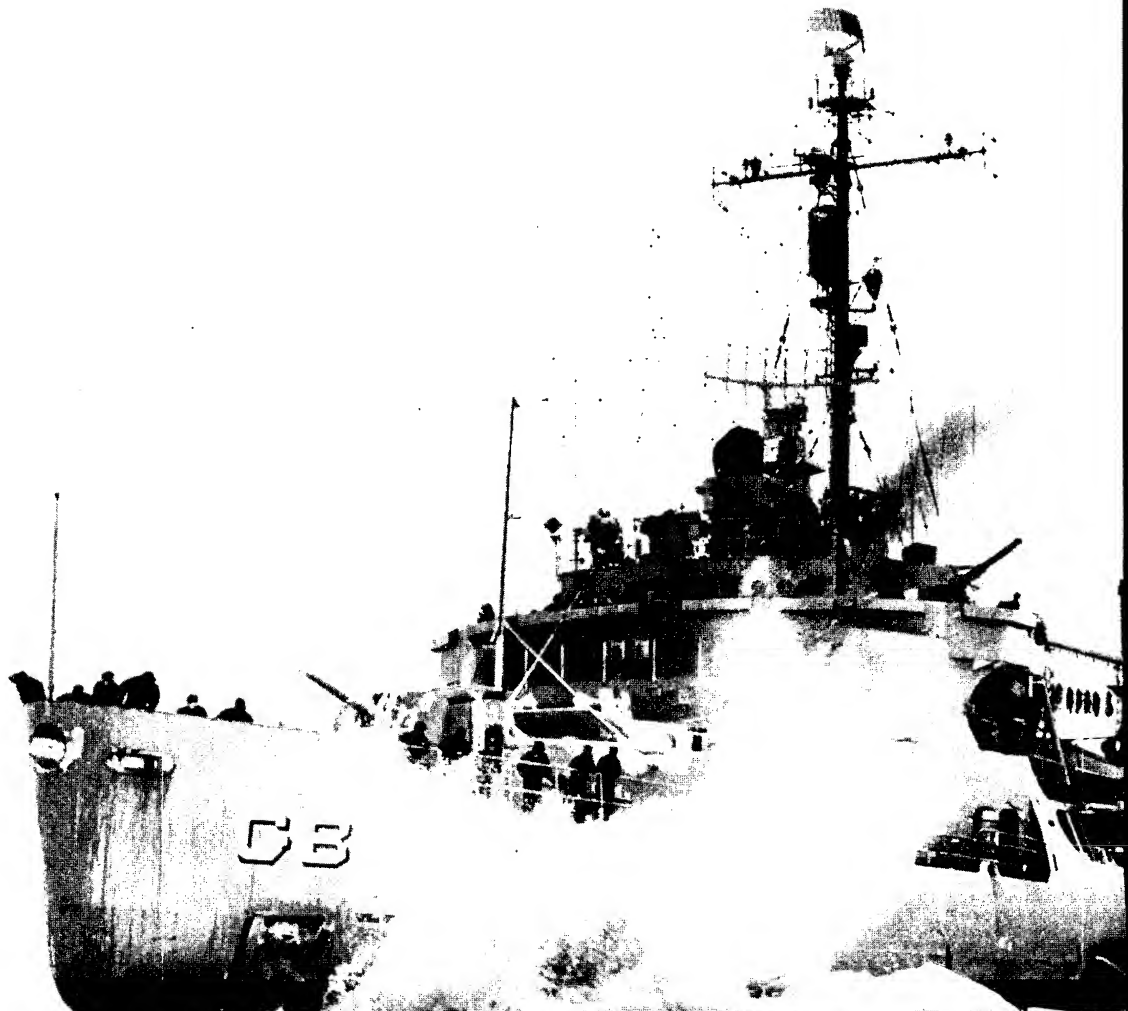
Someone had put up a sign that read:

There's no place
Any place like this place
Anywhere near this place
So
This must be the place.

To the south rose Observation Hill. I could easily see on the peak the tall cross raised by Scott's expedition mates to commemorate their leader's conquest of the Pole and his tragic death with his trail companions.

In McMurdo Sound I transferred from *Glacier* successively to the cargo ships *Wyandot* and *Arneb*. The captains of these two vessels, respectively Capt. Lindsey Williamson and Capt. Lawrence W. Smythe, not only were the finest of skippers but also were won-

John E. Fletcher, National Geographic Staff



derfully hospitable and considerate hosts.

From Little America, late in January, antarctic veteran Lt. Comdr. Jack Bursey and a six-man trail-blazing team headed across the inland ice in two Sno-Cats and a weasel. Their hoped-for destination was about 600 miles away at latitude 80° S., 120° W., the chosen site for the U. S. scientific outpost in Marie Byrd Land. But bad crevasses and engine trouble slowed the trail blazers and at last forced them to turn back 381 miles out.

An Otter aircraft had supported Bursey's party by laying down fuel caches. On February 3, while ferrying four members of the trail group back to Little America, the Otter failed to turn up.

Six days later, Lt. Don M. Sullivan, flying another Otter, spotted the smashed plane on a snowy mountainside in the Edward VII Peninsula near La Gorce Peak. But there were no men in sight.

The search plane couldn't land—the snow surface was too rough—so radioed the position and returned to Little America. A helicopter flew out and found tracks leading away from the crash scene. The "chopper" followed them and overtook the seven missing men 45 miles to the northwest.

Crash Victims Unhurt

None of the party had suffered anything worse than shock and scratches. The search Otter made rendezvous with the helicopter; between them the two aircraft evacuated the rescued men to Little America. It was miraculous that no one was hurt.

Their story: "We'd swung north of our course to duck bad weather. Ran into clouds, whiteout, and freezing drizzle. The plane iced up fast. We couldn't hold altitude and mushed, nose up, into the mountainside without ever seeing it till we hit."

They had broken out tents and dug into the snow. With food and fuel they were comfortable enough. On the fourth day they took off on foot toward Little America. They knew their exact position and figured they had enough food at least to reach Okuma Bay, where seals could be killed.

It was on the inland ice also that Antarctica struck one more fatal blow as the bitter autumn settled in. Construction Driver Max R. Kiel of Joseph, Oregon, was using his D-8 tractor to shove snow into an ice chasm to fill it up and thus make a bridge, when his vehicle plunged through another crevasse, hid-

den and unsuspected. So deep was the crevasse that neither the body nor the vehicle could be recovered.

Early in February I left Antarctica, returning to New Zealand on *Arneb* and continuing home by sea and air.

By the end of March all ships had left the Ross Sea area. Behind, 93 men remained at McMurdo Sound and 73 at Little America. These groups would spend the long antarctic winter getting ready to build the South Pole and Marie Byrd Land bases, work that will begin late in 1956, weeks before ships can reach Antarctica.

In March, Admiral Dufek led *Glacier* on a notable survey cruise halfway around the frozen continent. The purpose of the voyage was to find sites for two additional IGY scientific bases on the coast of Antarctica.

Site Found for New Base

Bucking the wretched weather of the antarctic fall, *Glacier's* survey teams picked one base site on the Knox Coast, at the Windmill Islands in Vincennes Bay.

Inland from this shore reaches out the vast expanse of Wilkes Land, named in honor of Charles Wilkes. As a young lieutenant, Wilkes led an American exploring expedition that skirted this coast in 1840. It was Wilkes, in fact, who first recognized that Antarctica probably was a great continent.

Admiral Dufek intended also to locate another base site near Gould Bay in the Weddell Sea. So late in the season this place could not be reached, although a party got ashore at Byrd Bay in Queen Maud Land.

Having fully proved her worth on a difficult maiden voyage, *Glacier* at last departed antarctic waters on March 30.

I hope this brief narrative has made it evident that the field tasks of Operation Deep-freeze were a cooperative effort of 1,800 well-trained men and officers.

On any large-scale expedition, and particularly where the scene of action is so hostile as Antarctica, success depends on efficient day-to-day fulfillment of responsibilities, including many that may at the time seem trivial. The over-all supervisory role which I held freed me from most operational detail.

The attainment of most of the goals set before Task Force 43 reflects great honor on the United States Navy. It is a tribute, too, to all the officers and men who took part in the expedition.



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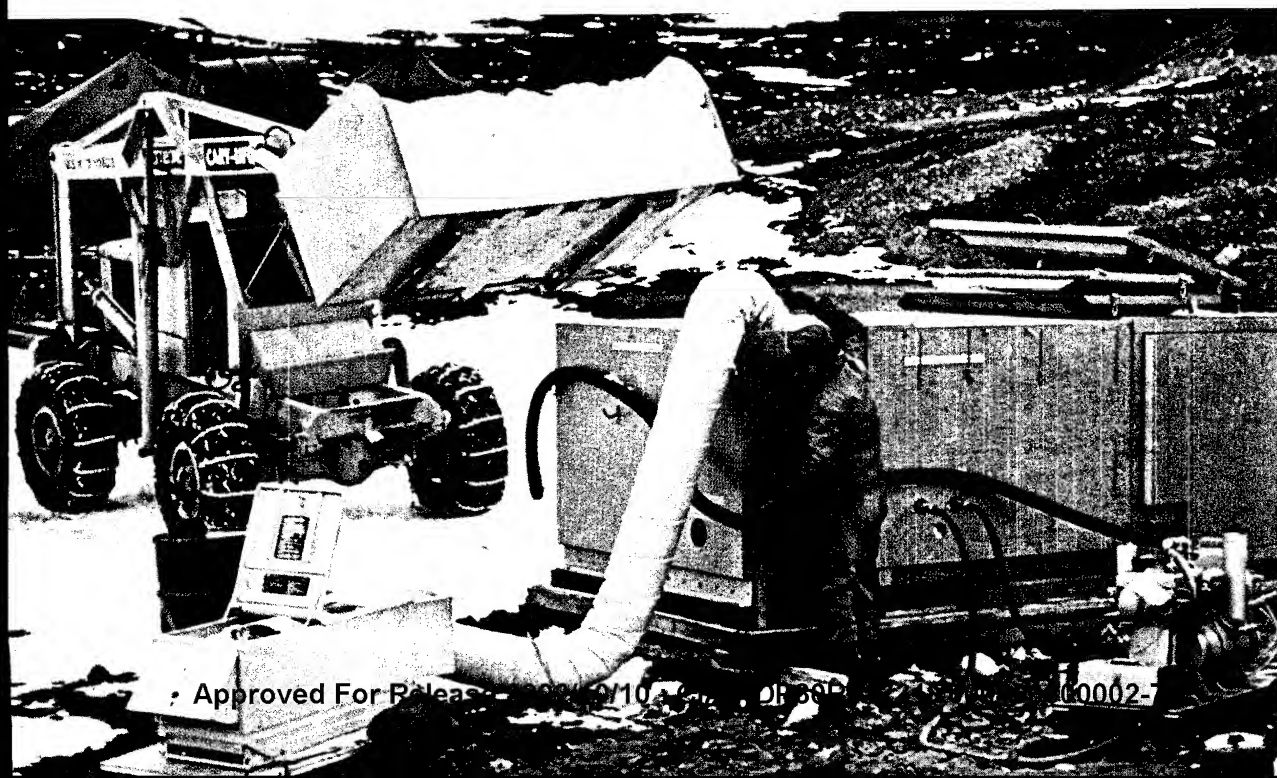
↑ **Restless Seas Gnaw the Barrier
at a Continent's Icy Rim**

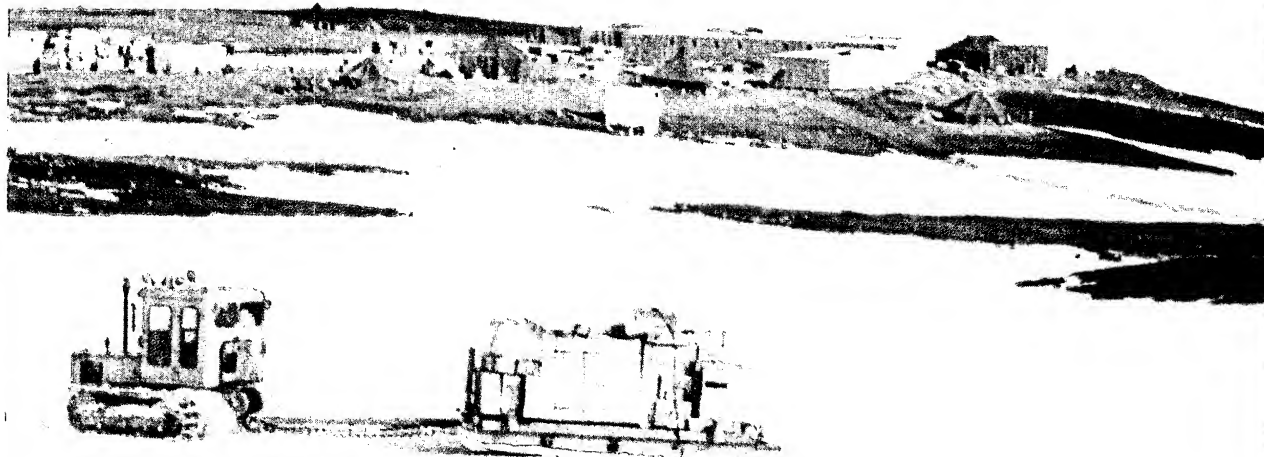
Wind, wave, and summer storm have swept sea ice from Kainan Bay. A ghostly veil of snow blows from the jagged face of the Ross Ice Shelf. Pushed by antarctic glaciers, the California-sized ice sheet here creeps seaward more than four feet a day.

↓ **Afloat in Near-freezing Waters,
Swimmers Test Polar Rescue Suits**

Navy volunteers Kenneth S. Meyer (left) and Roland R. Robichaud tread 29° F. water in McMurdo Sound, only 1.5° above sea water's freezing point. Survival suits of rubber and cotton over waffle-weave cotton longies keep the men surprisingly warm.







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↑ Snow Tractor Grows Uphill
to Hut Point Supply Dump

Williams Air Operating Facility, huddled on Ross Island's southern tip, was named for a Seabee lost when his tractor broke through ice into 600 feet of water.

McMurdo Sound's thick ice (background) will provide runways for the heaviest planes.

Atop Observation Hill (left) stands a wooden cross in memory of Captain Scott and four companions who died in March, 1912, while returning from the Pole. Carved on its staff are the oft-quoted words from Tennyson's *Ulysses*: "To strive, to seek, to find, and not to yield."

← Giant melter, heated by diesel exhaust, hot antifreeze, and hot air, turns snow to water at 100 gallons an hour.

→ Windows are usable in prefab buildings at wind-swept Hut Point. Four-inch-thick panels are plywood and aluminum sandwiches filled with Fiberglas.

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Kodachromes by Andrew H. Brown,
National Geographic Staff





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↑ **Pilots Chart a Flight Beyond the Pole**

On 10 survey sweeps by Deepfreeze planes, men saw for the first time some 800,000 square miles of unknown territory—a sixth of Antarctica. Comdr. Henry P. Jorda (left), pilot of the Navy R5D, confers with squadron leader Comdr. Gordon K. Ebbe on a 2,545-mile flight over the "area of inaccessibility," Antarctica's remotest region.

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↑ Take-off Rockets
Spew an Icy Plume
Across McMurdo Sound

JATO boosters, hurling a Neptune skyward beneath Mount Erebus, leave a mile-long trail of frozen vapor, smoke, and snow. An engine faltered on the return of this flight over Wilkes Land toward the Knox Coast. Jettisoning loose gear, the Neptune barely limped over the high mountains west of McMurdo and glided home to a single-engine landing.

Foreground plane awaits refueling from a near-by tanker tied up to the bay ice.

←The flight into the area of inaccessibility, to the right of the South Pole viewed from the Ross Sea, crosses jagged peaks knifing through a flowing sea of snow and ice. Beyond, the bleak polar plateau rises gently toward its highest level yet discovered, roughly 14,000 feet.

Iron oxides tint the mountain flanks reddish brown. Layered strata slashing across the nearest slope are sedimentary deposits, probably sandstones.

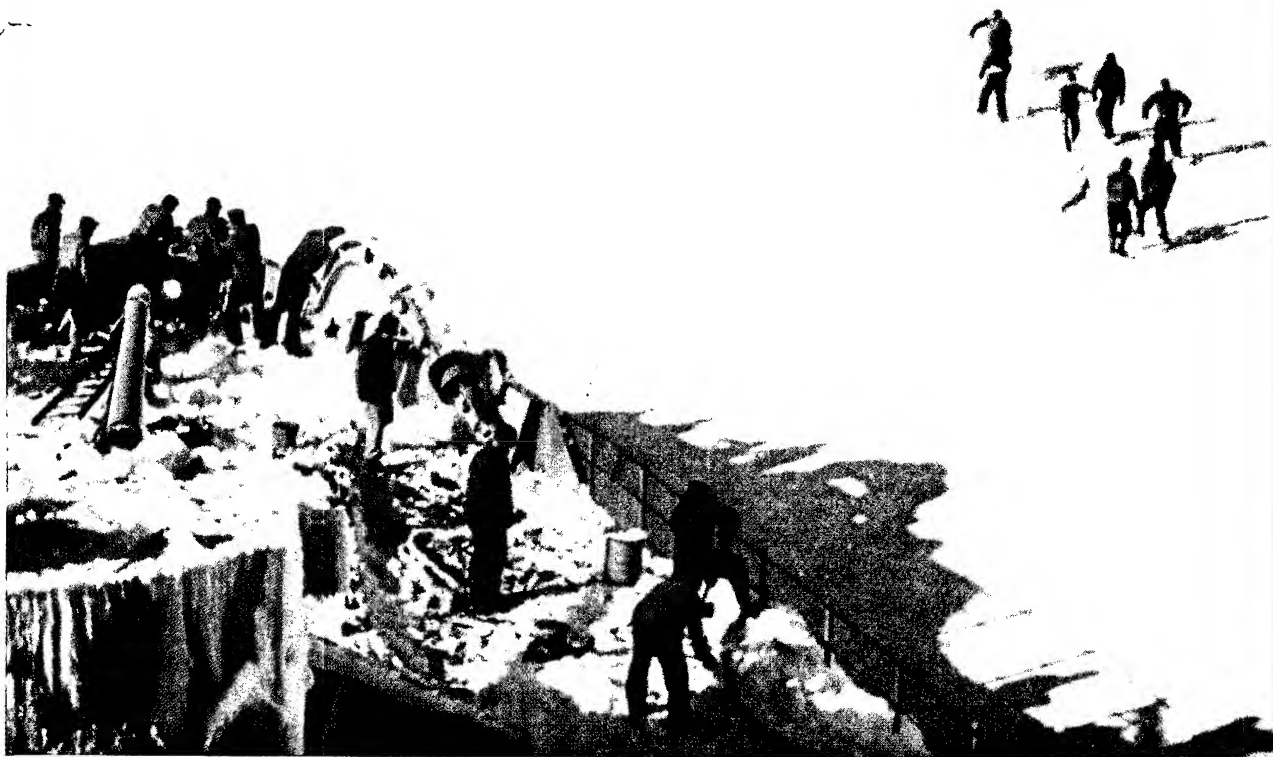
John E. Fletcher and (above)
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↑ Decks Rimed with Ice,
Glacier Noses Against the Barrier

In a cold, cutting February wind the icebreaker returns to Little America's frozen waterfront. Crewmen on the forecastle chop away a thick sheath of frozen sleet and spray on exposed lines and fittings. A mooring team linked by a safety line goes out on the ice. Flags stuck in the snow mark crevasses.

← A line-handling gang walks out the heavy wire mooring cable to a "deadman" of stout timber which has been frozen solid into the ice. In an emergency the mooring line can be freed quickly by knocking loose a wooden toggle.

After gun turrets straddling *Glacier's* flight deck are pointed forward to prevent guns from fouling helicopters. The ship's five-inch guns fired star shells to signal the fleet's rendezvous point when murky weather dimmed visibility and icebergs cluttered radarscopes.

→ Bundled in cold-weather gear, a sailor swings a wooden mallet to knock a six-inch crust of ice from the anchor chain.



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John E. Fletcher, National Geographic Staff

Icy Jaws of a Snow-bridged Crevasse Could Swallow Man or Tractor Train

Between sea edge and Little America V lay a fissured dip in the Barrier surface dubbed "Crevasse Valley."

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